MULTIMEDIA UNIVERSITY®

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2022/2023

PEM0016 – ALGEBRA

(Foundation in Engineering)

10 JULY 2023
9:00 a.m. – 11:00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **FOUR (4) pages** including a cover page with **FOUR (4) questions** only.
2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided. All necessary working **MUST** be shown.
4. Only **non-programmable** calculator is allowed.

QUESTION 1 [25 marks]

a. Find the real solution for:

i. $\frac{4}{x-2}=\frac{-3}{x+5}+\frac{7}{(x+5)(x-2)}$. (2 marks)

ii. $2^{2x+1}+5(2^x)-3=0$. (5 marks)

iii. $-2|2x+3|+14=-16$. (2 marks)

iv. $|2-7x|-1>5$. (2 marks)

b. Solve the equation of $\sqrt{2x+3}-\sqrt{x+2}=2$. (6 marks)

c. Solve the inequality and express your answer using interval notation. (8 marks)

$$\frac{s+1}{s-6}\geq\frac{s+2}{s-4}$$

QUESTION 2 [25 marks]

a. Find the domain for:

i. $h(x)=\frac{3x}{4x^2+144}$. (2 marks)

ii. $g(x)=\frac{\sqrt{x-3}}{x-6}$. (2 marks)

b. Given that $f(x)=\frac{x-5}{2x+1}$,

i. find its inverse, $f^{-1}(x)$. (2 marks)

ii. determine the domain and range of $f^{-1}(x)$. (2 marks)

c. Use transformation techniques to graph the function of $f(x)=-4e^{-x}+3$. Show all the stages. Determine the domain, range and asymptote of the function. (7 marks)

d. Solve the following:

i. $12^{2x+5}=55(7^{3x})$. (6 marks)

ii. $\log_a x+\log_a(x-2)=\log_a(x+4)$. (4 marks)

Continued...

QUESTION 3 [25 marks]

a. For the polynomial $f(x)=-2x^3-12x^2-16x$.

i. Use synthetic division to divide $f(x)$ by $(x+4)$. State the quotient and the remainder. (2 marks)

ii. Hence, factor the $f(x)$ completely. (1 mark)

iii. Determine the graph end behavior of $f(x)$. (1 mark)

iv. Find the x and y intercepts of the graph $f(x)$. (2 marks)

v. Determine whether the graph crosses or touches the x-axis at every x-intercept. (3 marks)

vi. Determine the maximum number of turning points of the graph. (1 mark)

vii. Find $f(-3)$ and $f(-1)$. (1 mark)

viii. Sketch the graph and clearly locate the x and y-intercepts on the graph. Locate all points obtained in part (vii) on the same graph. [Hint: Turning points occur at $x=-3,-1$]. (3 marks)

b. Find the Binomial expansion of $(a+b)^4$ and simplify the terms. Hence, find the values of h and k given that $\left(\sqrt{5}-3\sqrt{2}\right)^4=h+k\sqrt{10}$. (7 marks)

c. Find the partial fraction decomposition for $\dfrac{x+4}{(x)(x^2-2)}$. (4 marks)

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QUESTION 4 [25 marks]

a. Evaluate for $\begin{bmatrix} 2 & 1 \\ -5 & 3 \\ 1 & -2 \end{bmatrix}\begin{bmatrix} 2 & 1 \\ 2 & 3 \end{bmatrix} - 3\begin{bmatrix} 1 & 4 & -4 \\ 3 & 0 & -2 \end{bmatrix}^T$. (4 marks)

b. Find the values of x and y if $A^2 + xA + yI = 0$, where $A = \begin{bmatrix} 4 & -1 \\ 1 & 2 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$. (4 marks)

c. Use Cramer's Rule to solve the following problem:

"Angeline sold a total of 75 pastries and cakes today. Each pastry sells for RM 10 and each cake sells for RM 15. If Angeline earned RM 910 for the sales today, how many pastries and cakes did she sell?"

[Hint: Express the given problem above in matrix form $AX = B$]. (5 marks)

d. Solve the following linear system using the inverse method.

$$\begin{aligned} 2x + 8y &= 56 \\ 5x - y + z &= -13 \\ 2y - z &= 20 \end{aligned}$$ (12 marks)

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